

## **CLAIMS**

What is claimed is:

1. A method for energy and power estimation of a core-model based embedded system, the method including:  
5 capturing gate-level energy simulation data;  
deploying the captured gate-level simulation data in an algorithmic-level executable specification, wherein the captured gate-level data simulation data correlates to a plurality of instructions; and  
executing the algorithmic-level executable specification to obtain  
10 energy estimations for each instruction;
2. A method of modeling energy and power requirements for a system-on-a-chip, the modeling method including:  
deploying a circuit model of the system-on-a-chip by selecting at least one parameterized instruction-based core model and instantiating  
5 the at least one parameterized instruction-based core model;  
executing the circuit model;  
analyzing the estimated energy requirements of the circuit model;  
and  
outputting the estimated energy requirements for the circuit model.
3. The method of modeling energy and power requirements for a system-on-a-chip as claimed in claim 2, wherein the least one parameterized instruction-based core model includes toggle counts for a plurality of implementations of the deployed circuit model.
4. A method for creating a library of instruction-based core

energy models, the method including:

deploying a circuit model using a hardware description language;

defining a plurality of high-level instructions correlating to functions

5 supported by the circuit model;

acquiring gate-level energy simulation data for each component

comprising the circuit model;

collecting a plurality of toggle count sets corresponding to each of  
the plurality of high-level instructions;

10 assigning each of the plurality of toggle count sets to one of the  
plurality of high-level instructions, thereby creating an instruction-based  
core energy model; and

implementing the instruction-based core energy model within the  
library that is realized as a look-up table.

5. The method for creating a library of instruction-based core  
energy models as claimed in claim 4, wherein the step of assigning each of  
the plurality of toggle count sets to one of the plurality of instructions  
further includes increasing the number of high-level instructions to reduce  
5 data dependency.

6. A computer program product for use in a computer system  
in which core models are accessed by an application program, the  
computer program product including a computer usable medium bearing  
computer executable code, the computer executable code including:

5 a first executable code portion for determining if the core model  
should simulate an idle state or execute an instruction, based upon  
whether the core model is called by another core model or it is called by a

control object;

a second executable code portion for determining if resources  
10 required by the core model are free, and claiming the free resources;

a third executable code portion for adding an idle energy value to  
an energy accumulator;

a fourth executable code portion for determining if a clock counter  
are decremented, thereby collecting data about the elapsed time and  
15 calculating the consumed power from the energy data;

a fifth executable code portion for simulating execution of a  
predetermined instruction; and

a sixth executable code portion for adding energy value to the  
energy accumulator;

7. A computer program product for use in a computer system  
in which core models are accessed by an application program, the  
computer program product including:

a computer usable medium bearing computer programming  
5 statements for enabling the computer system to create at least one circuit  
model object for use by the application program;

the computer programming statements including a class library  
expressing an inheritance hierarchy and including at least one core model  
base class for constructing instances of the at least one circuit model  
10 object, the core model base class representative of a circuit element;

the at least one core model base class including, as a respective  
subclass thereof, an autonomous core model class defining at least one  
core model member function for directly interacting with the application

program; and

15           the at least one core model member function simulating an  
instruction associated to the circuit element, the circuit element providing  
one-time predetermined data correlated to the simulated instruction.

8.       In a computer system having an application program that  
models the energy and power requirements of a system-on-a-chip circuit  
design, an energy and power modeling method for an application program  
to access and execute a parameterized core model of a circuit element,  
5       the method including:

          providing to the application program a circuit object representing a  
modeled circuit, the circuit object having instantiated at least one  
parameterized core model having at least one member function for  
simulating functions assigned to circuit element, wherein the at least one  
10       member function outputs an energy and power estimation correlated with  
each simulated function;

          sending a message from the application program to the circuit  
object to invoke the at least one member function, thereby executing a  
simulated function of the circuit element; and

15       sending a message from the circuit object to the application  
program embodying the energy and power estimation with respect to the  
invoked member function.